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A STATISTICAL ANALYSIS OF THE DETERRENCE AND SUBSTITUTION EFFECTS OF THE MILITARY SERVICES' DRUG PREVENTION PROGRAMS

by

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The results indicate that the military's drug testing program is a deterrence to illicit drug use. The results also provide evidence that the military's drug testing program produces an unanticipated positive effect of reducing heavy alcohol consumption. Lastly, results of our analysis indicate that there is no selection bias; individuals who are likely to choose military service would not be less prone to use illicit drugs than their civilian counterparts in the absence of the testing program.

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This thesis measures the deterrence and substitution effects of the military's drug testing program. Data used is from the 1995 and 1980 versions of the Department of Defense "Survey of Health Related Behaviors Among Military Personnel" and the 1995 and 1979 versions of the "National Household Survey on Drug Abuse." The statistical analyses examine three separate but related topics: (1) The deterrence effect of the military's drug prevention programs; (2) The possible substitution of legal for illegal substances; and (3) The role of selection bias in estimates of the deterrence effect.

The results indicate that the military's drug testing program is a deterrent to illicit drug use. The results also provide evidence that the military's drug testing program produces an unanticipated positive spillover effect of reducing heavy alcohol consumption. Lastly, results of our analysis indicate that there is no selection bias; individuals who are likely to choose military service would not be less prone to use illicit drugs than their civilian counterparts in the absence of the testing program.

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I. INTRODUCTION

A. ENVIRONMENT

There are numerous prior studies that have detailed the adverse effects of illicit drug abuse. Research has provided extensive information on the physical and psychological consequences of drug use on one's health, quality of life and economic well-being [Ref. 1]. Despite extensive public and private campaigns illustrating the devastating consequences of illicit drug use, a large segment of our society continues to engage in some form of illicit drug use. In a 1991 survey of 18-34 year-olds, approximately 60 percent of the respondents reported having used illicit drugs [Ref 2].

One important segment of society where the negative consequences are felt is the labor market. Costs are imposed on employers due to increases in medical outlays, lost work time due to absenteeism and lower on the job performance. These and similar factors often make a drug prevention policy defensible on economic grounds [Ref 3].

Due to the negative effects of illicit drug and alcohol abuse, the Department of Defense (DoD) has adopted numerous polices and programs to monitor, deter and educate service members on the damaging effects of drug use. In 1967, a DoD task force was convened to examine illicit drug

use within the military [Ref. 16]. By 1971, the task force initiated a DoD urinalysis program with the purpose of assisting the rehabilitation of illicit drug users. However, it was not until 1980 that the DoD was able to implement a drug-testing program which allowed DoD to take punitive action on those testing positive on urinalysis tests. Drug testing could now be used as both a deterrent as well as a measure to assist individuals in their need for drug rehabilitation [Ref. 17].

The effectiveness of the military's drug testing program has been demonstrated, but there is still some controversy over how often to test [Ref. 4]. Borack and Mehay provide the following discussion on the lack of a rationale or model underlying the correlation between key aspects of drug testing and drug deterrence:

> The concepts of deterrence, detection, gaming and non-gaming users, and the components of cost and benefits have not been rigorously defined and the relationships between these components has not been postulated. Without an underlying conceptual model, the ability to determine an optimal drug testing policy is sharply diminished and selection of specific testing rates and strategies must be based on general impressions rather than scientific models. [Ref. 4]

The costs involved in administering the urinalysis test, including the costs associated with lost training time, are considerable. However, the benefits of reducing drug use,

including the negative physical and psychological effects of illicit drug use, are well studied and validated in numerous publications [Ref. 3].

B. OBJECTIVE

The objective of this study is to examine the deterrence effect associated with the military's drug testing policy. The study investigates the extent to which service members may substitute legal drugs or alcohol for illicit drugs in response to the threat of detection via the testing program. Quantitative techniques will be used to analyze the effects of the DoD's drug prevention program on drug use behavior, including possible accompanying substitution effects.

C. THE RESEARCH QUESTION

The primary research questions are:

- What is the effect of the military's drug testing policies in terms of deterring would-be drug users?

- Is there a secondary impact of drug testing in terms of inducing personnel to substitute one type of substance abuse for another, in particular to substitute legal drugs or alcohol for illegal drugs?

Secondary research questions include:

- Is the measured deterrence effect due to the threat of detection or to selection bias associated with individuals who choose the military over the civilian sector?

D. SCOPE OF STUDY

Previous studies have been conducted using the 1995 Department of Defense's "Survey of Health Related Behaviors Among Military Personnel" and the National Institute of Drug Abuse's "1995 National Household Survey for Drug Abuse" to examine the effect of the military's drug testing policies in terms of deterring drug use among the military population. However, the prior research did not consider whether users who are deterred from illegal drugs may simply shift away from illegal to legal substances[1] [Ref. 5]. This study will compare otherwise similar individuals from the military and from the civilian sector to determine the size of the deterrence effect and whether there is a substitution effect due to the military's drug testing and "zero tolerance" policies.

E. ORGANIZATION OF STUDY

Chapter II presents a review of relevant studies on drug use. Chapter III provides background on the Department of Defense "Survey of Health Related Behaviors Among Military Personnel" and on the "1995 National Household Survey on Drug Abuse." Chapter IV discusses in detail the theoretical model, the specification of the

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[1] Thesis work by Capt. Antonio Martinez provided a preliminary examination of the magnitude of the deterrence effect of the military's program [Ref. 5].

empirical models, hypothesized relationships and testing procedures. Chapter V presents the results of estimating the multivariate models to determine deterrence and substitution effects. Chapter VI presents results of estimating multivariate models to determine the role of selection bias. Chapter VII summarizes the conclusions of the analysis, addresses the limitations of the study, discusses policy implications and provides recommendations for areas of further research.

II. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

A. THEORY

This study focuses on drug use among various groups and establishing the importance of various explanatory factors. It is the purpose of this study to develop a statistical model that examines the effect of the military's drug testing program on drug behavior and the incentives for personnel to substitute legal drugs for illegal drugs. The literature review will examine the Navy's drug testing program and previous attempts to statistically measure deterrence effects.

B. LITERATURE REVIEW

The Navy's drug prevention efforts hinge primarily on its drug testing (urinalysis) program. Up to 90 percent of the Navy's 1994 drug prevention budget supports the drug-testing program. The goal of the Navy drug program is to randomly sample 10-20 percent of the Navy's personnel every month. This represents almost 2 million samples each year. Table 2.1 depicts the results of the Navy's urinalysis testing program for selected years. Table 2.1 shows that the proportion of test takers who test positive for illegal drugs has fallen from almost three percent in 1985 to only 0.81 percent in 1993.

Table 2.1 Navy Urinalysis testing Program

USN Urinalysis	FY-85	FY-87	FY-89	FY-91	FY-92	FY-93
Number tested (Millions)	1.82M	2.3M	2.06M	1.75M	1.81M	1.68M
Number Positive (Thousands)	54K	47K	30K	11K	14K	13K
Percent Positive	2.98%	2.37%	1.45%	.64%	.78%	.81%

Source: Chief of Naval Technical Training, 1994 [Ref. 15].

The Chief of Naval Education and Training (CNET) supervises the drug testing of new entrants to the Navy. Each service branch also tests all personnel upon entering basic training. In addition to drug testing, a process called the "Moment of Truth" is used to screen recruits prior to training. This is an attempt to give recruits one last chance to reveal any information (including the use of drugs) that might potentially disqualify an individual for military service. Thesis work by Capt. Tony Martinez (USMC) found that the military's drug testing program has a deterrent effect on illicit drug use [Ref 5]. However, the effectiveness of drug testing in detecting drug abusers depends on numerous factors including the timing of the drug test, method of testing, and whether the user is attempting to 'game' or beat the system.

Many researchers point to the reduction in DoD drug abuse rates as evidence that the military's drug testing policy is effective [Ref 6]. R. M. Bray provides the

following conclusion regarding the DoD's urinalysis program:

> The substantial declines in drug use since the urinalysis testing program which began in 1981 and belief of military personnel in its deterrent properties lend support to the conclusion that the program is an effective strategy for preventing and reducing drug use.

The effectiveness of the drug prevention program is linked to four basic conditions:

- Randomness of the drug test
- A clear understanding of the consequences for drug abuse ("Zero tolerance")
- Command level implementation of the program
- Reliability/Believability of the drug test

Drug testing in the civilian sector has increased dramatically in the past decade. The American Management Association (AMA) conducts surveys of its corporate membership, which accounts for about 25 percent of the American work-force.[2] In the last ten years since AMA first initiated the survey, drug testing among American corporations has increased by more than 300 percent [Ref 7]. One reason for increased civilian drug testing is due to government mandates. Many specific job categories require companies to provide drug testing of job

[2] AMA surveys are not intended to provide statistically accurate sampling of all American corporations but do indicate the growing trend of the civilian sector toward the use of urinalysis testing for drug deterrence.

applicants. Even companies with occupations that do not have mandated drug testing have increased their use of drug testing.

Recent studies have demonstrated interdependencies among alcohol, tobacco, and some illicit drugs [Ref. 11]. However, results from these studies are inconclusive. Some research points to a complimentary effect between alcohol, tobacco and illicit drugs while others indicate that efforts to reduce alcohol use by raising prices of alcohol have reduced youth's demand for alcohol but may have unintentionally increased marijuana use.

The lack of consistent results may be due to limitations in the availability of data. For example, several recent studies rely on data where penalties for illicit drug use vary from state to state yet the research did not control for state fixed effects [Ref. 11]. While other price and policy variables used in research are measured at the state level, there may still be unobserved characteristics of the state that affect patterns of drug use. Omitting these characteristics will bias important coefficients. Fixed effects techniques are one method of adjusting for such differences. Differences in research results may also result from constantly changing laws and

the inability to capture the true effects of interdependency at a single point in time [Ref. 11].

In a 1997 study Chaloupka and Laixuthai attempted to determine whether youths substituted alcohol for marijuana [Ref. 12]. The authors used data from the 1982 and 1989 Monitoring the Future Surveys (MTF) of high school seniors. The surveys provided the annual level of marijuana and alcohol use among the youth population. The authors obtained data on local area alcohol prices from the "American Chamber of Commerce Researchers Association" (ACCRA). ACCRA surveys between 200 and 300 cities quarterly, collecting information on the prices of numerous consumer goods, including beer, wine and hard liquor [Ref. 12]. The authors chose to use only the price of beer in their model because it is the most heavily consumed alcoholic beverage by youths. The ACCRA beer price and cost-of-living index are matched to the surveys by county in each of the first two quarters of 1982 and 1989 [Ref. 12]. The model also included the quarterly national Consumer Price Index (CPI) for the first two quarters of 1982 and 1989 to obtain real prices. Real prices for alcohol are obtained by deflating the price of beer by both the national CPI and ACCRA cost-of-living index and taking the average of the real prices for the first and second

quarters. To capture the full price of marijuana, two variables are added to the model. The first is a dichotomous indicator equal to one for youths residing in a state where marijuana possession is decriminalized and equal to zero otherwise. Marijuana consumption is expected to be higher in states which have decriminalized marijuana.

The second variable represents the actual price of marijuana. Prices for marijuana are reported at both the wholesale and retail levels. Obtaining the actual price of marijuana was difficult. Chaloupka and Laixuthai obtained prices from the "Drug Enforcement Agency's System to Retrieve Information from Drug Evidence" (STRIDE) data base. STRIDE reports prices for 19 major metropolitan areas. If a youth resides in a county containing a city in the STRIDE database, then the price in that city is used. This is considered a perfect match. To match the price data to the survey data where no perfect match exists, Chaloupka and Laixuthai located the nearest location to the youth's residence and defined three levels of "match quality" in their strategy. The first level of quality is defined as a "border" match which indicates that the STRIDE city is in a county which borders on the youth's county of residence and is in the same state; a "state" match is one where the price is for a city within the same state but is

not a "perfect" or "border" match; the third match is a "poor" match which is one where the price comes from a city in another state. Two levels of "poor" quality are defined based on the physical distance between the youth's residence and the city price being used. A distance of over 50 miles and a city in another state are considered the poorest of matches.

Problems arise obtaining accurate price data for marijuana. First, price data is only available for the fourth quarters of 1988 and 1989. Price data for 1982 was not available. Thus all equations estimated prices using only the 1989 cross-section. Second, price data is reported as a range of values rather than as a single value. In an example provided by the authors, the range of commercial grade marijuana in one city at the wholesale level sold at a low of $350 to a high of $1,800. The authors used the midpoint of the range reported in the STRIDE data as the price of marijuana [Ref. 12]. Thus, there is certain to be some measurement error in the marijuana price data.

Chaloupka and Laixuthai examined the relationship between youth drinking and heavy drinking and estimated demand for these substances as a function of the price of alcohol, legal drinking ages, and the price of marijuana.

Additionally, the probability of a non-fatal youth traffic accident is estimated as a function of alcohol and drug abuse. State level youth motor traffic accident rate data was obtained from the National Highway Traffic Safety Administration, Fatal Accident Reporting System (FARS) [Ref. 12].

A pooled time-series of annual state cross-sections for all continental U.S. states for the period 1975 to 1988 was used to examine the effects of alcohol and marijuana prices on the probability of a fatal youth motor accident. The study recognized that not all motor vehicle fatalities result from drunk or drugged drivers but does find strong corollary evidence between abuse of substances and fatal accidents.

Results of the study suggest that increases in the price of beer reduce alcohol consumption in both frequency and intensity. Furthermore, there was a corresponding increase in marijuana use as the price of alcohol rose. Additional findings suggest that reducing the supply of marijuana, and thus increasing its price, will reduce marijuana consumption but will also have the unintended consequence of raising alcohol consumption [Ref. 12]. The final result of significance from the study indicated that areas where marijuana use was decriminalized were

geographic areas where youths were more likely to use marijuana but were also more likely to substitute marijuana for alcohol [Ref. 12]. Thus, alcohol and marijuana appear to be economic substitutes.

A similar study by Rosalie Pacula, completed in 1997, provides evidence to the contrary from that of Chaloupka and Laixuthai. Her analysis uses micro-level data from the National Longitudinal Survey of Youth (NLSY) to estimate demand equations for marijuana and alcohol. Pacula attempts to determine the relationship between alcohol and marijuana by analyzing the sign and significance of cross-price effects in individual-level demand equations [Ref. 13]. She offers a unique perspective in her analysis by including variables that indicate the relative enforcement risk in dealing and using marijuana as well as specific levels of enforcement. Pacula uses a "crimes per officer" ratio to examine the risk associated with being caught with illegal substances and the correlation to drug and alcohol use [Ref. 13].

Pacula's model examines a youth's desire or preference to use drugs and assumes that individuals attempt to maximize their period-specific utility. In this case, utility is assumed to be a function of alcohol, marijuana and a composite good that is subject to period-specific

budget constraints. Other variables in her model represent legal risks associated with consumption, and unobservable tastes. The models developed by Pacula demonstrate when an individual will initiate consumption of a drug based on the marginal benefits from consuming a particular drug. In her model the demand functions being derived are Marshallian which means that it is possible for alcohol to be a complement to marijuana but can also be a substitute for alcohol. The relationships do not have to be symmetrical [Ref. 13].

The NLSY data used is based on a multistage stratified area probability sample representative of individuals ages 14 to 21 who live in the continental United States. The survey was completed in 1979 and was conducted by the Center for Human Resource Research of Ohio State University. There were 12,686 participants in the 1979 survey which includes extensive information about the individuals not typically collected. Particularly interesting is the nature of personal and family characteristics i.e., was the respondent raised by both parents, whether the respondent's mother worked and whether the individual had an alcoholic parent [Ref. 13]. The study finds that these variables are important to the respondent's decision to use drugs [Ref. 13].

Results of her study indicate that alcohol and marijuana are economic complements, that increases in the federal tax on beer will generate a larger reduction in the unconditional demand for marijuana than for alcohol. Two unique items stand out in Pacula's findings: 1) That minimum legal purchasing age has no significant influence on either the probability of consuming alcohol or the quantity consumed once one controls for being of a legal age to drink; 2) That the "crime per officer" ratio and not state decriminalization status is significant in the demand equation for marijuana [Ref. 13].

Other evidence of a relationship between alcohol and marijuana is proved by a 1998 study by Chaloupka and Saffer. The authors estimate demographic differentials in alcohol and illicit drug use, participation and own price effects and cross price effects using data from the National Household Survey on Drug Abuse (NHSDA).

Data on alcohol prices came from the American Chamber of Commerce Research Association's quarterly Inter-City Cost of Living Index (1988, 1990, 1991) [Ref. 14]. The data represents prices for over 250 cities and was merged with NHSDA. The authors create a single alcohol price variable by first determining the price of one pure liter of alcohol. This was done for beer, wine and liquor.

Since beer is typically sold in six packs, a six pack was divided by 2.13 to obtain the price per liter. Similar conversions were done for wine and liquor. Next, these liter prices were divided by the percent alcohol in each beverage. A weighted average price of pure alcohol was then computed for comparison. Data for alcohol content came from the Brewer's Association of Canada International Survey. Prices were then adjusted to represent 1982 to 1984 values [Ref. 14].

Prices for illicit drugs come from STRIDE [Ref. 14]. Similar to the procedure described for determining the price of pure alcohol, Saffer and Chaloupka project the price of one unit of 100 percent pure drug. The log of purity was regressed on the log of weight and included dummies for unobserved city and time specific factors. Saffer and Chaloupka provide the following explanation for obtaining this price information:

> "This regression was performed by entering log weight and log estimated purity as separate variables and constraining their coefficients to be identical. Setting weight at 1 unit and purity at 100 percent makes the log of these values zero. The estimated coefficients of the city dummies and time dummies were then used to predict a price for every city-time combination. The projected price is the price of one unit of 100 percent pure drug. The antilog was then computed and the local level prices were aggregated to the state level [Ref. 14]."

Saffer and Chaloupka compute the weighted average for each city in each state and compute the population weights by dividing the population by the total population of all represented cities in each state. Population data came from the 1993 City and County Data book [Ref. 14].

Saffer and Chaloupka link drug and alcohol prices and policies to individual NHSDA records and the models estimated represent demand curves [Ref. 14]. Own-price effects were examined within demographic groups with the purpose of finding evidence of complimentary, substitutability or independence between alcohol and drugs [Ref. 14]. The results of the study show a pattern of negative own-price effects for alcohol and illicit drugs and a complimentary relationship between alcohol and illicit drugs. The eight demographic groups included: 1) the full sample; 2) White male; 3) Blacks; 4) Native Americans; 5) Asians; 6) Hispanics; 7) Women; and 8) Youth. Each demographic group was found to behave similarly with each other [Ref. 14].

Specific results of this study are broken down by alcohol and type of drug consumed. Each are compared among the eight demographic groups. The alcohol results indicate that participation and use are lower than in the full sample for Blacks, Native Americans, Asians, Hispanics,

Women and Youth. The regression coefficients are negative and significant for Black, Asian, Hispanic and Youth. Gender is positive and significant indicating that Women consume less alcohol than men. The own participation price elasticities were estimated for the significant price coefficients and demonstrated that elasticity did not vary significantly across the demographic groups. Marijuana results for the eight demographic groups was similar among other substances. Participation and use were lower in the full sample for Native Americans, Asians, Hispanics and Women. Youths had a higher participation rate but lower use rate than the full sample [Ref. 14]. The regression coefficients were negative and significant for Blacks, Asians and Hispanics. Gender was positive and significant indicating that women consume less drugs than men. Conclusions drawn from this study suggest that there is a complimentary relationship between alcohol and illicit drugs.

A final study examined in this paper attempts to evaluate the effects of alternative government policies aimed at curbing the use of illicit drugs and alcohol and clarifies the interactions between alcohol, tobacco and marijuana [Ref. 11]. The concern for the interdependencies among these substances is highlighted

because of recent policies affecting the price of these substances. For example, recent efforts to increase the cigarette tax may have the intended consequence of lowering consumption of cigarettes but may also have the unintended consequence of encouraging an increase in the consumption of a substitute substance. The authors have three specific aims: 1) To use the NHSDA data-base to estimate the demand for marijuana as a function of the availability of marijuana as measured by the eradication programs funded by the DEA; 2) To estimate demand models for tobacco and alcohol use in the past 30 days as a function of own and cross prices; and 3) To examine the sensitivity of the models to various specifications [Ref. 11].

Data on marijuana is provided by the Domestic Cannabis Eradication/Suppression Program, a program funded by the DEA. The annual number of plants that are cultivated and eradicated by each state is then adjusted by the population by state. Alcohol price information comes from the American Chamber of Commerce Research Associations Inter-City Cost of Living Index. From this index, state annual averages for the price of beer, wine and liquor are constructed. Year indicator variables are included in the pooled independent cross-sectional data set to include the effects of national policies, i.e. changes in taxes or

changes in efforts to curb the supply of drugs entering the U.S.

The authors report on the marginal effects of the price and policy effects on alcohol, tobacco and marijuana use as well as the relationships among the substances. In modeling demand the authors focus on the decision to use alcohol, tobacco or marijuana. To examine the sensitivity of the analysis a set of variables reflecting one's assessment of the risk associated with using these substances is used.

Results of this study indicate that an increase in the eradication of cultivated marijuana plants of 10 percent leads to a statistically significant decrease in the probability of marijuana use in the last month by 0.2 percent [Ref. 11]. Results for alcohol use in the past 30 days indicates a negative and statistically significant relationship to the real price of liquor [Ref. 11]. The evidence provided in this study indicates that alcohol, tobacco and marijuana are economic complements to each other. Thus, curbing the use of one through prices and other regulatory policies has a spillover effect on the other substances [Ref. 11].

III. BACKGROUND

A. DEPARTMENT OF DEFENSE SURVEY OF HEALTH RELATED BEHAVIORS AMONG MILITARY PERSONNEL

The 1995 Department of Defense Survey of Health Related Behaviors Among Military Personnel (DODWWS) was conducted by the Research Triangle Institute for the Department of Defense. The primary objectives of the survey were: "(1) to improve the understanding of the nature, causes, and consequences of substance use and health in the military; (2) to determine the appropriateness of the emphasis placed on program elements; and (3) to examine the impact of current and future program policies" [Ref. 8]. In addition to the primary objectives, a broader goal of the survey was to establish baseline data to assess progress toward selected DoD health objectives for active-duty military personnel.

The 1995 DODWWS survey is the sixth in a series of DoD Surveys of active-duty military personnel. The first survey was conducted in 1980. The survey is based on a two-stage cluster design to ensure accurate representation of the worldwide active-duty military force. The first-stage sample consists of military installations and associated units clustered with the installations based on geographical proximity for each service located in four

broad regions of the world (Americas, North Pacific, Europe and Other Pacific). The second-stage sample consists of military personnel stationed at the same military installations stationed at the selected first-stage regions. Personnel selected are based on a stratified sampling to ensure sufficient size with respect to rank and gender.

During Phase 1 of the 1995 survey, which occurred during the time period from mid-April through August 1995, field teams administered questionnaires in group settings at the selected installations world wide. Interviewers explained the purpose of the survey and assured that all information received would be kept confidential. Respondents were encouraged to cooperate and provide honest answers. The questionnaires were distributed to participants on optically-marked forms who returned them via a self-enclosed envelope. The interviewers shipped the completed questionnaires to the scoring contractor for optical-scan processing upon receipt.

During Phase 2, the interviewers mailed questionnaires to selected personnel who did not respond in Phase 1. The questionnaire provided instructions, an explanation of the purpose and guarantee of anonymity. On average, the questionnaire required approximately 1 hour to

complete. The response rate for Phase 1 was approximately 88 percent [Ref. 8]. The overall response rate for the eligible population was 69.6 percent. The final 1995 DODWWS data set consists of 16,193 observations (4,440 Air Force, 4,265 Navy, 3,960 Marine Corps and 3,638 Army). Included in the survey were 395 questions that pertain to illicit drug, alcohol and tobacco use within the military.

B. NATIONAL HOUSEHOLD SURVEY ON DRUG ABUSE

The 1995 National Household Survey on Drug Abuse (NHSDA) is part of a series of nationwide surveys designed to measure the prevalence of drug use among U.S. households. The 1995 NHSDA is the fifteenth in a series of studies which began in 1971. The first two studies were conducted under the direction of the National Commission on Marijuana and Drug Abuse. The National Institute of Drug Abuse sponsored the NHSDA from 1974 to 1991. Beginning in October 1992, the NHSDA responsibility was moved to the Office of Applied Studies within the Substance Abuse and Mental Health Services Administration (SAMSHA). SAMSHA is a branch of the U.S. Department of Health and Human Services [Ref. 9].

The primary objective of the NHSDA is to measure the prevalence of use of illicit drugs, alcohol, tobacco

products, and non-medical use of prescription drugs in the United States [Ref. 9]. The population estimates were published to provide communities interested in drug abuse prevention, treatment and research institutions timely data on trends and demographics correlated with illicit drug use.

The survey was based on a stratified, multi-stage area probability sample. For the 1995 survey, 115 districts were selected for the first stage of sampling. The target population included all residents in a household (including civilians living on military bases). This population sample includes non-institutional group quarters such as dormitories and shelters. Participants are all 12 years old and older. Persons excluded were active duty military, transient populations and residents of institutional quarters, e.g., hospitals, jails, etc. The data collection was acquired continuously over the calendar year [Ref. 8].

Survey data was collected through personal visits to each selected residence. Researchers conducted a short voluntary screening of the resident to verify information on age, race, sex, marital status and current smoking status of each 12-year-old or older resident. The information was gathered then used in a random selection procedure that determined which resident members would be

selected for an in-depth interview. The 1995 survey selected individuals on the basis of selection probabilities. Hispanic and Black neighborhoods were over-represented in an effort to ensure that adequate sample sizes were obtained. The survey design used a composite size measurement methodology and a specially designed within-dwelling selection procedure to ensure desired sample sizes would be achieved for sub-populations defined by age and race/ethnicity. In 1995 a total of 22,016 persons were selected for an interview and 17,747 interviews were completed. Response rates for screening was 94.2 percent and for interviewing, 80.6 percent. The interviewer had no influence on the conduct of the individual being interviewed nor on the selection process. All interview questions were kept confidential by including a self-administered answer sheet for the collection of sensitive information [Ref. 10].

Weighting of the analysis was calculated to compensate for non-response and under-coverage. A post-stratification adjustment was made to force the respondent weights to equal U.S. Bureau of the Census projections of the civilian, non-institutionalized population.

The final 1995 NHSDA data set consists of 17,747 observations with 1,250 variables pertaining to illicit

drugs, alcohol and tobacco use. The target population was non-institutionalized U.S. civilian population age 12 and older.

C. SURVEY LIMITATIONS

The NHSSDA and DODWWS surveys omit individuals from their sample population who may have a particular propensity for illicit drug and alcohol abuse (e.g. transients, jail occupants in the NHSDA and personnel AWOL and in the process of changing duty stations in the case of the DODWWS). Additionally, the non-response rate in each survey increases the possibility of bias in the estimate of use rates.

Both surveys are cross-sectional. They provide a snapshot of individuals at a point in time and not throughout a selected time period. Longitudinal studies track respondents over time, which allows the analyst to note trends and modifications to behavior. The limitation of cross-sectional data is that it can only provide the prevalence of illicit drug use and alcohol use at a specific point in time.

Lastly, both surveys depend on self-reporting. The potential unwillingness of an individual to accurately report their illicit drug or alcohol use may lead to under-reporting bias based on the circumstances of the

situation. Individuals may be inclined to under-report adverse behavior possibly for fear of reprisal. Both surveys have attempted to help participants feel that their privacy has been protected to ensure the validity of the surveys.

IV. METHODOLOGY

The specification of a model of individual drug use is based on traits likely to predict potential drug users. How contributing factors influence the decision to use drugs and how alterations in this behavior can be achieved is important in accomplishing many of the specific goals of programs for controlling substance abuse.

Military and civilian drug use patterns are expected to differ. Drug testing within the military, combined with the "zero tolerance" policy, is the deterrent that may explain part of this difference. Selection bias is also a factor that must be considered. Although difficult to measure, selection bias associated with choosing to serve in the military may partly explain differences in the demand for drugs between individuals in the two sectors.

A. MODEL SPECIFICATION

Several multivariate logit models aré specified to explain the differences in individual propensity for drug use. These models yield the expected proportion of drug use in the civilian and military community and attribute the differences to various demographic characteristics. Following a model developed by Martinez [Ref. 5] a binary dependent variable is created based on reported drug use in the DODWW or NHSDA survey. The

variable equals one when self-reported drug use is positive, zero otherwise. A multivariate logit model was used to compare the inclination for drug use between civilians and military personnel. The model provided the proportion of illicit drug users based on factors represented in both the civilian and military personnel survey sample. The parameter estimates provide the change in the log odds of the dependent variable for a one-unit change in the independent variable, while holding all other explanatory variables constant

1. Description of Dependent and Explanatory Variables

The factors which are included in our model were selected based on their relationship to the propensity for illicit drug use or alcohol use, on whether the variable had been used in past studies, and, finally, on whether the necessary information was available in both the DODWWS and NHSDA data sets.

Most of the explanatory variables were dummy (binary) variables. They were coded as a one if the event was true for the respondent and coded as a zero if the event was false. Variables were created and defined from both the DODWWS and NHSDA data files. These files were merged into a single data file to facilitate statistical analysis.

a. Dependent Variables

Two variables were created to assess the effect of the military's testing policies on potential substitution away from drugs to alcohol. One dependent variable 'HEAVY' was created which represents a respondent who has, within the last thirty days, consumed six or more alcoholic beverages in one sitting. The definition of a 'heavy drinker' is based on previous studies [Ref. 12, 13]. However, no common definition for heavy alcohol use has been adopted. In a 1997 study by Chaloupka and Laixuthai a heavy drinker was defined as one who had consumed at five drinks on one drinking occasion in the two weeks prior to the survey [Ref. 12]. The Substance Abuse and Mental Health Services Administration Office of Applied Studies (SAMSHA) has three definitions for alcohol use. The category representing the greatest amount of alcohol consumption is defined as "five or more drinks on the same occasion on at least five different days in the past month" [Ref. 10]. Some studies considered consuming at least six drinks in one sitting within the last 30 days as a 'heavy drinker' whereas others required the consumption of more than six [Ref. 12, 13, 14].

DODWWS specified the variables by type of drink (Spirit, Wine or Beer) and asked the respondent to indicate

the number of drinks consumed of each particular type of beverage in one sitting within the past 30 days. Thus, in this thesis, if any one of the three categories of alcoholic beverages, spirits, wine or beer, were consumed six or more times in one sitting, within the past 30 days, the respondent was classified as a "Heavy" user. If the respondent consumed any drinks at all within the last 30 days, the respondent was classified as "Lite" user. All "Heavy drinkers" were also included in the definition for "Lite" because by definition they had consumed at least one alcoholic beverage within the past 30 days. The NHSDA survey did not specify alcohol use by type of drink as in the DODWWS; rather, a cumulative response was recorded for the number of drinks consumed at one sitting. The corresponding number of all types of drinks within the past 30 days was used to define "Heavy" and "Lite" users. The two variables were created and portrayed as binary dummy variables and coded = 1 if the respondent satisfied the conditions of that category, or = 0 if otherwise. The similar variable definition from the DODWWS and NHSDA were subsequently merged into a single data set to facilitate statistical analysis.

The dependent variables DRUG12 and DRUG30 were chosen because they provided information regarding a respondent's

illicit drug use for the past 12 months and 30 days, respectively. The 12-month variable provides information to help determine the effect of various drug testing programs over a longer period. The 30-day use variable was chosen because many of the users have less than 12 months total time in service and the military is primarily concerned with recent drug use and not past use. For example, a respondent with less than 12 months of service was likely to be a high school senior not subject to any drug testing programs. Table 4.1 describes the four dependent variables used in the models.

b. Explanatory Variables

The independent variables were chosen based on factors that are hypothesized to be correlated with illicit drug use and alcohol use. Additionally, the variables had to be defined consistently in both the NHSDA and DODWWS so that the two surveys could be merged into a single data set. Explanatory variables included in the model are gender, marital status, education level, age, race, and military status. Table 4.2 provides a description of the independent variables and their descriptions.

Table 4.1 Dependent Variable Definitions

VARIABLE	DEFINITIONS
HEAVY	= 1 if the respondent has consumed at least six alcoholic drinks in one sitting within the last month = 0 otherwise
LITE	= 1 if the respondent has consumed at least one alcoholic beverage within the last month = 0 otherwise
DRUG30	= 1 if the respondent used any illicit drugs during the past month = 0 otherwise
DRUG12	= 1 if the respondent used any illicit drugs during the past year = 0 otherwise

Source: Variables constructed by author from the merged 1995 DODWWS and 1995 NHSDA surveys.

Table 4.2 Independent Variable Definitions

VARIABLE	DEFINITIONS
SINGLE	= 1 if the respondent is currently divorced, separated or single = 0 otherwise
MARRIED	= 1 if the respondent is married = 0 otherwise
NOHSD	= 1 if the respondent has no high school diploma = 0 otherwise
GED	= 1 if the respondent has a GED or alternate education degree = 0 otherwise
HSDG	= 1 if the respondent has a high school diploma = 0 otherwise
SOMCOLL	= 1 if the respondent has attended some college, but does not have a degree = 0 otherwise
COLLGRAD	= 1 if the respondent has a college degree = 0 otherwise
AGE1	= 1 if the respondent is between the ages of 17 and 20 = 0 otherwise
AGE2	= 1 if the respondent is between the ages of 21 and 25 = 0 otherwise
AGE3	= 1 if the respondent is between the ages of 26 and 34 = 0 otherwise
AGE4	= 1 if the respondent is between the ages of 35 and 49 = 0 otherwise
KIDS	= 1 if the respondent has children living with them = 0 otherwise
IRAGE	= Respondent's age in years
WHITE	= 1 if the respondent is White = 0 otherwise
BLACK	= 1 if the respondent is Black = 0 otherwise
HISPANIC	= 1 if the respondent is Hispanic = 0 otherwise
OTHRACE	= 1 if the respondent is not White, Black or Hispanic with regard to race = 0 otherwise
MALE	= 1 if the respondent is a male = 0 otherwise
FEMALE	= 1 if the respondent is a female = 0 otherwise
MILITARY	= 1 if the respondent is an active duty member of the U.S. Military = 0 otherwise

Source: Variables constructed by author from the merged 1995 DODWWS and 1995 NHSDA surveys.

Table 4.3 provides the mean values (proportions) and standard deviations of the variables described in tables 4.1 and 4.2. Columns 1 and 2 provide the means and standard deviation for the combined sample. The civilian data from the NHSDA is restricted to ages 17 to 49 to align civilians with the age groups represented in the military population. There are 28,079 observations in the pooled sample. Column 3 provides the means for the military sample from the DODWWS, which has 16,067 observations. Column 4 provides means for the civilian sample, which contains 12,012 individuals.

Table 4.3 Variable Means (Ages 17-49)

VARIABLE	MEAN Combined Military & Civilian	STD DEV Combined Military & Civilian	Mean Military Sample Only	Mean Civilian Sample Only
HEAVY	0.2959151	0.4564611	0.1669260	0.4684482
LITE	0.6551872	0.4753157	0.7530964	0.5242258
DRUG30	0.0551478	0.2232727	0.0221074	0.0993173
DRUG12	0.1000890	0.3001240	0.0472514	0.1707459
SINGLE	0.4448520	0.4969582	0.3419431	0.5825008
MARRIED	0.5551480	0.4969582	0.6580569	0.4174992
KIDS	0.5011218	0.5000076	0.4981017	0.5051615
NOHSD	0.1109726	0.3141038	0.0243356	0.2268565
HSDG	0.3068485	0.4611942	0.2930230	0.3253413
SOMCOLL	0.3461306	0.4757439	0.4364847	0.2252747
COLLGRAD	0.2119377	0.4086883	0.2461567	0.1661672
IRAGE	30.2251505	8.1878730	31.1104749	29.0409590
WHITE	0.5903344	0.4917808	0.6865003	0.4617050
BLACK	0.1973361	0.3979952	0.1656812	0.2396770
HISPANIC	0.1631112	0.3694737	0.0826539	0.2707293
OTHRACE	0.0492183	0.2163273	0.0651646	0.0278888
MALE	0.6327148	0.4820737	0.8158337	0.3877789
FEMALE	0.3672852	0.4820737	0.1841663	0.6122211
SAMPLE SIZE	28,079	-	16,067	12,012

Source: Calculated from merged 1995 DODWWS and 1995 NHSDA data

The means and standard deviation among military members in Table 4.3 are lower for most of the dependent variables (in the top section of Table 4.3) as compared to civilian counterparts. That is, drug and heavy alcohol use tends to be lower among those in the military. The exception is for LITE, which indicates that a higher proportion of military personnel consume alcohol. Military members are more likely to be married, male and to have some college. The independent variables that are lower among civilians as compared to military members are: SOMCOLL, COLLGRAD, WHITE OTHRACE, IRAGE, and MALE.

B. HYPOTHESIZED RELATIONSHIPS

The hypothesized signs for the variables are based upon the literature review. Married persons (MARRIED) are expected to be less likely to use drugs than single persons due to increased responsibilities, increased likelihood of having families and because they are generally older than their single counterpart. Persons who fail to complete high school (NOHSD) are hypothesized to demonstrate an inability to take responsibility, accomplish goals, and are thought to be younger, immature and more irresponsible that their high school graduate counterparts. Likewise,

individuals with more education (SOMCOLL, COLLGRAD) are thought to be more responsible and better able to understand the consequences of illicit drug use and alcohol abuse. Thus, the higher the education level, the less likely one is to use these substances. Having children living within ones' home (KIDS) is thought to represent individuals who have assumed family responsibilities and who recognize the need for maturity and responsibility and will be less likely to use drugs or alcohol. Younger individuals (IRAGE) are likely to be drug users. Respondents below the mean age in our model are thought to be more willing to experiment and may lack the judgment found as one grows older. The race (WHITE, BLACK, HISPANIC, OTHER) of an individual is hypothesized to be a predictor of one's likelihood to abuse substances. Typically, minorities come from family backgrounds and neighborhoods where incomes are lower and drugs are an option for many to escape the ill effects of poverty. Males are also hypothesized to be more inclined to use drugs than females primarily due to their greater propensity for risk taking behavior.

C. HYPTHESIS TESTING PROCEDURES

The variables defined in Tables 4.1 and 4.2 were constructed by re-coding variables from the NHSDA and DODWWS surveys so that variable definitions were identical. Both data sets were merged into one single data set for analysis. A logit estimate is derived using non-linear maximum likelihood techniques. In addition to the parameter estimates, a marginal analysis was performed to reveal how much more likely a person is to use drugs or alcohol based on various personal attributes. The base case for the model is a single, white male who possesses a High School Diploma and is 30.2 years of age. (30.2 years represents the mean age of our respondent in the 17-49 year-old category). The analysis of alcohol use was conducted using the dependent variable HEAVY. (The variable HEAVY represents a respondent who has consumed at least six or more alcoholic beverages in one sitting within the last 30 days.) If alcohol use among military members is higher than it is among civilians, this suggests that the military's drug testing program produces a substitution effect, i.e., drug testing causes or is a factor in people substituting away from tested substances to legal substances. If alcohol use is lower among military members than among civilians, this provides some evidence that

there is a complimentary relationship between illegal substances and alcohol and that the military's drug testing program may tend to reduce both. Alternatively, if alcohol use is lower among service members it may simply signal differences between service members and civilians that arise due to self selection or to administrative criteria applied by the military for selection among applicants.

V. MODEL RESULTS

A. DETERRENCE MODELS

The first model estimated re-examines the deterrence effect originally estimated by Martinez who examined drug use patterns of civilians and military members. Martinez restricted the civilian sample to those ages 17 to 49. Because enlistees are eligible to retire as early as age 38, there are few members in their 40's. Thus, we restrict the samples to ages 17 to 34 and then to ages 17 to 25. The results of the logit model are depicted in Table 5.1, which combines the military and civilian samples.

The model specification is:[3]

DRUG12 = f(MILITARY, FEMALE, MARRIED, BLACK HISPANIC, OTHRACE, AGE2, AGE3, AGE4 KIDS NOHSD, HSDG, SOMCOLL, COLLGRAD) (EQ. 1)

Column (1) of Table 5.1 displays the results from Martinez' original estimates for ages 17-49, column (2) shows our results for ages 17-34, and column (3) presents our results for ages 17-25. All of the variables in Table 5.1 are significant at the 5 percent level or greater except for OTHRACE and SOMCOLL.

[3] Martinez' specification uses age dummies (AGE2, AGE3, AGE4) rather than a continuous age variable.

Table 5.1 Logit Estimates of Drug Testing Deterrence Effect; Military versus Civilian samples for Alternate Ages ranges. Dependent Variable = DRUG12

INDEPENDENT VARIABLE	DEPENDENT VAR. DRUG12 (Age 17-49)	DEPENDENT VAR. DRUG12 (Age 17-34)	DEPENDENT VAR. DRUG12 (Age 17-25)
Military	-1.2770 (0.0528)	-1.4005 (0.0577)	-1.1963 (0.0747)
Female	-0.4280 (0.0405)	-0.3872 (0.0496)	-0.2853 (0.0621)
Kids	N.I.	-0.2902 (0.0563)	-0.2808 (0.0740)
Married	-0.8520 (0.0491)	-0.5791 (0.0600)	-0.5491 (0.0831)
Black	-0.2898 (0.0489)	-0.2771 (0.0600)	-0.3259 (0.0761)
Hispanic	-0.5432 (0.0539)	-0.6148 (0.0661)	-0.5896 (0.0816)
Othrace	-0.2552 (0.1041)	-0.2778 (0.1217)	-0.2143 (0.1412)
Age2	0.2365 (0.0597)	-0.1565 (0.0605)	-0.1903 (0.0634)
Age3	-0.1265 (0.0601)	-0.5414 (0.0643)	N.I.
Age4	-0.7327 (0.0770)	N.I.	N.I.
HSDG	0.3639 (0.0633)	-0.1628 (0.0628)	-0.1179 (0.0782)
SOMCOLL	0.2192 (0.0727)	-0.2341 (0.0714)	-0.1858 (0.0912)
COLLGRAD	-0.2195 (0.0853)	-0.2341 (0.0919)	-0.7752 (0.1427)
CONSTANT	-1.1200 (0.0453)	-0.1907 (0.0645)	-0.3171 (0.0747)
Concordance Ratio	73.2%	72.9%	68.7%
Sample Size	32,850[4]	16,591	9,784

Notes: Based on merged 1995 DODWWS and NHSDA data.
Standard Errors in Parentheses
N.I. = Not included

Columns 2 and 3 of Table 5.1 restrict the sample in Martinez' original model to age groups that better mirror the age range represented in the military population. The results indicate that compared to Martinez, being in the military and being subjected to drug testing has a slightly smaller deterrence effect on past-year drug use for 17-25 year olds, and a slightly larger effect for 17-34 year olds. Also, the coefficients of several of the explanatory variables differ between the samples. In Martinez' results

[4] Sample size is taken from Martinez' model. He measures the effects for 17-49 year olds, but it appears that he failed to delete civilians under 17 and over 49 years of age, and military members over 49 years of age. This accounts for the difference in sample sizes between this thesis and his.

HSDG and SOMCOLL have positive coefficients, which is somewhat surprising. For the age categories 17-34 and 17-25, we find that the coefficients are negative suggesting that there is indeed a negative relationship between education and drug use in the restricted age category.

Among 17-34 year olds the results indicate a somewhat greater deterrence effect than for either of the other age groups. Independent variables FEMALE, KIDS, MARRIED, HISPANIC, OTHRACE, HSDG, SOMCOLL have an even greater negative effect for 17-34 year olds than for 17-25 year olds. In no case does the coefficient on MILITARY vary by more than 5 percent. These results suggest that the military's prevention policies have a deterrence effect on illegal drug use and that the deterrence effect does not vary much for different age ranges.

In our analysis we alter Martinez' original model specification and further restrict the civilian comparison group. The results of the new logit models are depicted in Table 5.2 and 5.3, which combine the military and civilian samples, and analyze DRUG12 and DRUG30, respectively. The model specification is:

$$\text{DRUG12 or DRUG30} = f(\text{MILITARY, FEMALE, MARRIED, BLACK HISPANIC, OTHRACE, IRAGE, KIDS, NOHSD, HSDG, SOMCOLL, COLLGRAD}) \quad \text{(EQ. 2)}$$

Our model differs from Martinez' original estimate by the use of a continuous age variable, IRAGE, in our use of high school graduates as the base case and by our inclusion of GED's as non-high school graduates, and addition of a variable for children (KIDS). By using a continuous age variable, we are able to provide a more precise measure of the effect of age on drug use.

The logit procedure is used to fit a logistic regression model to the probability of a positive response as a function of variables in our model. Logit estimates of coefficients are difficult to interpret. To aid in the interpretation of estimated coefficients we also compute marginal effects. A base case or benchmark is established in our model and other possible values of each explanatory variable is compared to the base case. Marginal effects are calculated from the logit model and provide a measure of the relative size of each variable. The base case used in our model is a single, 30 year old, civilian male, who is a high-school graduate with no kids. We compute the probability of drug use for this 'notional' person then examine the difference in probability of drug use for a person with slightly different characteristics.

Tables 5.2 and 5.3 display the results for the sample of 17 to 49 year olds. Column (1) shows the parameter

estimates, column (2) shows the standard errors and column (3) shows the *p*-values. The computed marginal effects are provided in column (4). Most of the variables in Tables 5.2 and Tables 5.3 are generally significant at the 5 percent level or greater.

Table 5.2 Logit Estimates of Drug Testing Deterrence Effect; Military versus Civilian samples
Dependent Variable DRUG12 (Ages 17-49)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-1.4661	0.0526	0.0001	-20.70%
Female	-0.3982	0.0463	0.0001	-7.58%
Kids	-0.2846	0.0501	0.0001	-5.56%
Married	-0.5913	0.0549	0.0001	-10.70%
Black	-0.2424	0.0552	0.0001	-4.78%
Hispanic	-0.6090	0.0620	0.0001	-19.97%
Othrace	-0.2326	0.1125	0.0386	-4.60%
IRAGE	-0.0520	0.00325	0.0001	-0.01%
HSDG	-0.0872	0.0596	0.1436	1.85%
SOMCOLL	-0.2100	0.0648	0.0012	-4.18%
COLLGRAD	-0.5894	0.0813	0.0001	-10.67%
CONSTANT	0.7756	0.0915	0.0001	-
Concordance Ratio	77.2%	-	-	-
Sample Size	28,075	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

Table 5.3 Logit Estimates of Drug Testing Deterrence Effect: Military versus Civilian samples Dependent Variable DRUG30 (Ages 17-49)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-1.5913	0.0709	0.0001	-14.10%
Female	-0.5072	0.0593	0.0001	-6.48%
Kids	-0.2256	0.0643	0.0004	-3.16%
Married	-0.6612	0.0733	0.0001	-8.02%
Black	-0.1478	0.0695	0.0335	-2.13%
Hispanic	-0.5672	0.0793	0.0001	-7.10%
Othrace	-0.1363	0.1460	0.3507	-1.97%
IRAGE	-0.0376	0.00409	0.0001	-0.006%
HSDG	-0.1811	0.0732	0.0133	-2.89%
SOMCOLL	-0.2907	0.0805	0.0003	-4.18%
COLLGRAD	-0.8624	0.1086	0.0001	-9.77%
CONSTANT	-0.1721	0.1120	0.1246	-
Concordance Ratio	77.4%	-	-	-
Sample Size	28,070	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

Comparing Table 5.2 to Table 5.1 (column 1) shows that the deterrence effect of being subject to military drug policies in our re-specified model (using DRUG12) is comparable to that in Martinez. We see similar results in our model when we use the dependent variable drug use in the last 30 days (DRUG30). HSDG becomes significant in Table 5.3, but OTHRACE is not significant at the 5 percent level. Thus our profile of a likely drug user (a young, white, unmarried male with less education) changes only minimally when comparing drug use within the last 12 months with drug use in the last 30 days.

Examining the marginal effects in each table also yields similar results. Most significant is the finding

that the variable with the largest relative impact is being in the Armed Forces. Using the 'notional' person described above and changing only whether the person is in the military reduces the probability of drug use in the past year by 20 percentage points, representing a reduction of 70 percent. For past month drug use the probability is 14 points lower, a reduction of nearly 80 percent. We also compute the difference in drug use between the 'typical' service member (i.e., the one with mean or median characteristics) and the 'typical' civilian. For DRUG12 the difference is 74 percent, and for DRUG30 the difference is 78 percent. These latter calculations represent a more accurate assessment of the drug use differences between the two populations. These latter calculations using the mean characteristics portray similar findings to the 'notional' person used in the model.

B. TESTS FOR SUBSTITUTION EFFECTS

To test for potential substitution effects, the third model analyzes the impact of being in the military on alcohol use. The specification of the model in Table 5.4 is much like the drug use models in Tables 5.2 and 5.3. The dependent variable LITE represents a respondent who has consumed alcohol at least once within the last 30 days. The model specification for LITE is:

$$LITE = f\ (MILITARY,\ FEMALE,\ MARRIED,\ BLACK\ HISPANIC,\ OTHRACE,\ IRAGE,\ KIDS,\ HSDG,\ SOMCOLL,\ COLLGRAD) \quad \text{(EQ. 3)}$$

Every variable in Table 5.4 is significant at the 1 percent level except IRAGE, which is not significant. The coefficient of the military variable indicates that military members are more likely to consume some alcohol in the last 30 days than civilians. The results suggest that the effect of military policies on drug use may have an unintended consequence of encouraging consumption of alcohol. Thus, there may be a substitution effect between illegal drugs and alcohol. However, the seriousness of this substitution is questionable as it represents an increase in occasional alcohol use.

The marginal effects represent the difference from our base case (single, white male with minimal education). In Table 5.4 we find that females are 13.52 percent less likely to use alcohol on an occasional basis, married individuals are 5.02 percent less likely and Blacks are 12.73 percent less likely. Those in the survey that are members of the armed forces are 10.09 percent more likely to be an occasional alcohol user. Those with some college education are 7.91 percent more likely and those with a college degree have an 11.75 percent higher likelihood of being an occasional drinker.

Table 5.4 Logit Estimates of Lite alcohol use
Military versus Civilian
Dependent Variable LITE (Ages 17-49)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	0.6040	0.0325	0.0001	10.09%
Female	-0.6140	0.0297	0.0001	-13.52%
Kids	-0.2485	0.0300	0.0001	-5.13%
Married	-0.2433	0.0331	0.0001	-5.02%
Black	-0.5809	0.0344	0.0001	-12.73%
Hispanic	-0.4186	0.0381	0.0001	-8.93%
Othrace	-0.5342	0.0606	0.0001	-11.62%
IRAGE	0.00045	0.00186	0.8093	-0.0001%
HSDG	0.3835	0.0435	0.0001	-8.13%
SOMCOLL	0.4544	0.0453	0.0001	7.91%
COLLGRAD	0.7296	0.0508	0.0001	11.75%
CONSTANT	0.6414	0.0634	0.0001	-
Concordance Ratio	68.4%	-	-	-
Sample Size	28,079	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

The fourth model analyzes the impact of being in the military on heavy alcohol use to obtain a more reliable test of the substitution effect. Again, the specification of the fourth model in Table 5.5 is much like the models in Table 5.4. The dependent variable HEAVY represents a respondent who has consumed a minimum of six alcoholic beverages on at least one occasion during the last 30 days.

The model specification for HEAVY use is:

HEAVY = f (MILITARY, FEMALE, MARRIED, BLACK HISPANIC, OTHRACE, IRAGE, KIDS, HSDG, SOMCOLL, COLLGRAD) (EQ. 4)

In Table 5.5 each of the variables is significant at the 1 percent level. Of particular importance in this model is the magnitude of the marginal effects with respect

to being in the military. Compared to the base case, armed forces members have a probability of heavy alcohol use that is 43.56 points lower than civilians (a difference of more than 50 percent). We also compute the difference in heavy alcohol use between the 'typical' service member (i.e., the one with mean or median characteristics) and the 'typical' civilian. For HEAVY the difference is 48 percent, which represents a more accurate assessment of the alcohol use between the two populations. Individuals with some college education (SOMCOLL) are 10.47 points more likely to abuse alcohol and those with a college education (COLLGRAD) are 7.20 points more likely to do so.

Table 5.5 Logit Estimates of Heavy alcohol use
Military versus Civilian
Dependent Variable HEAVY (Ages 17-49)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-1.8677	0.0356	0.0001	-43.56%
Female	-0.4068	0.0328	0.0001	-9.03%
Kids	-0.3573	0.0324	0.0001	-7.87%
Married	-0.1928	0.0348	0.0001	-4.13%
Black	-0.4557	0.0389	0.0001	-10.19%
Hispanic	-0.4434	0.0414	0.0001	-9.89%
Othrace	-0.3978	0.0739	0.0001	-8.82%
IRAGE	-0.0172	0.00199	0.0001	-0.36%
HSDG	0.7271	0.0460	0.0001	-16.81%
SOMCOLL	0.5850	0.0486	0.0001	10.47%
COLLGRAD	0.3814	0.0542	0.0001	7.20%
CONSTANT	-0.3573	0.0665	0.0001	-
Concordance Ratio	74.5%	-	-	-
Sample Size	28,079	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

The results reject the hypothesis that drug testing may induce a substitution effect among military personnel i.e., that military drug testing policies would entice service members to substitute from illicit drugs to heavy drinking. Table 5.5 indicates that heavy alcohol use is lower among military members. On the other hand, we find that military members are more likely to consume some alcohol as compared to their civilian counterparts. On balance, we find that being in the military and being subject to drug testing may have a positive spillover effect in terms of discouraging military members from excessive drinking.

Alcohol consumption is not tested nor subject to the military's "Zero Tolerance" policy but in recent years has come under increased scrutiny. Increased disciplinary action for incidents involving alcohol may contribute to this deterrence effect. Thus, the deterrence effect of drug testing appears to be undervalued to some extent due to the possibility that it also decreases heavy alcohol use. This analysis supports the view in the literature that drug and alcohol consumption are complements.

C. ANALYSIS OF DETERRENCE EFFECTS USING RESTRICTED SAMPLES

The next test restricts the analysis even further to match more closely the employment and background characteristics of military members to the characteristics

of civilians. In the restricted analysis officers are deleted from the DoD file due to generally low prevalence rates among officers. The attempt in the merged data set is to closely match the characteristics of civilian workers with the characteristics of the enlisted military population. In the NHSDA file, two categories of occupations associated with white-collar professional employment are omitted: Category 1, which includes Executive, Administrative and Managerial Occupations, and Category 2, which includes Professional Specialty Occupations. After imposing these additional restrictions the data file has 22,377 observations, a loss of about 6,000 observations.

The means and standard deviation of the variables in the restricted file are presented in Table 5.6. The means in Table 5.6 for most of our dependent variables -- DRUG12, DRUG30, and HEAVY -- are lower in the military sample as compared to civilian sample. The sole exception is LITE, which is higher for military members. Additionally, the following independent variables are lower among enlisted military members as compared to their non-professional civilian counterparts: SINGLE, NOHSD, COLLGRAD, BLACK, HISPANIC, KIDS and FEMALE.

Table 5.6 Variable Means in Restricted Data File
Enlisted Members and Blue Collar civilian age range 17-49

VARIABLE	MEAN Combined Military & Civilian	STD DEV Combined Military & Civilian	Mean Military Sample Only	Mean Civilian Sample Only
HEAVY	0.2970908	0.4569871	0.1986395	0.4215746
LITE	0.6340439	0.4817080	0.7369348	0.5039466
DRUG30	0.0609772	0.2392939	0.0260271	0.1051407
DRUG12	0.1099044	0.3127775	0.0560359	0.1780004
SINGLE	0.4773652	0.4994986	0.3771108	0.6041287
MARRIED	0.5226348	0.4994986	0.6228892	0.3958713
KIDS	0.4959557	0.4999948	0.4765106	0.5205424
NOHSD	0.1347812	0.3414974	0.0300920	0.2671524
HSDG	0.3639451	0.4811439	0.3692677	0.3572151
SOMCOLL	0.3931269	0.4884555	0.5274110	0.2233354
COLLGRAD	0.0788309	0.2694807	0.0732293	0.0859138
IRAGE	29.1744202	8.0852466	29.7591036	28.4351346
WHITE	0.5470796	0.4977897	0.6427371	0.4261283
BLACK	0.2189748	0.4135608	0.1938375	0.2507590
HISPANIC	0.1824641	0.3862352	0.0924370	0.2962963
OTHRACE	0.0514814	0.2209825	0.0709884	0.0268164
MALE	0.6290387	0.4830729	0.8117647	0.3979964
FEMALE	0.3709613	0.4830729	0.1882353	0.6020036
SAMPLE SIZE	22,377	-	12,495	9,882

Source: Based on merged 1995 DODWWS and NHSDA data.

The civilian comparison group was selected based on the hypothesis that blue-collar civilian workers are more comparable to the types of occupations of military enlistees. To start with, we restrict the sample by eliminating civilians with college degrees. The assumption is made that the typical blue-collar worker is not a college graduate. The corresponding match in the military for a blue-collar worker is an enlisted member. We eliminate college graduates and officers in the DoD file since virtually all officers in the military have college

diplomas. The NHSDA survey provides a range of sixteen occupational categories. Two of the sixteen categories (professional and administrative workers) are considered occupations that require college diplomas. We also have omitted these occupational categories in an attempt to match respondents in the NHSDA survey more closely with the DODWWS.

Table 5.7 Logit Estimates of Drug Testing Deterrence Effect; Enlistees versus Blue Collar Civilian workers Dependent Variable DRUG12 (Ages 17-49)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-1.3862	0.0569	0.0001	-19.35%
Female	-0.3864	0.0499	0.0001	-7.16%
Kids	-0.2949	0.0538	0.0001	-5.59%
Married	-0.5727	0.0595	0.0001	-10.11%
Black	-0.2220	0.0581	0.0001	-4.29%
Hispanic	-0.6363	0.0656	0.0001	-11.04%
Othrace	-0.2043	0.1186	0.0849	-3.96%
IRAGE	-0.0539	0.00353	0.0001	-1.08%
HSDG	-0.1377	0.0615	0.0253	2.88%
SOMCOLL	-0.2574	0.0681	0.0002	-4.93%
COLLGRAD	-0.5067	0.1094	0.0001	-9.10%
CONSTANT	0.8276	0.0971	0.0001	-
Concordance Ratio	76.1%	-	-	-
Sample Size	22,374	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

The results of our analysis of DRUG12 are displayed in Table 5.7. The results are similar to those obtained for the sample that includes officers and white-collar professionals in Table 5.2 above. In Table 5.7 we see a slight reduction of the deterrence effect when military officers and civilian white-collar professionals and

administrative workers are excluded from the sample. This difference may be due to the small number of professionals actually deleted from our sample. Alternately, it may indicate that the magnitude of the deterrence effect is masked due to the small percentage of white-collar and officers in our population or to the similar underlying deterrence effect between the two populations.

Table 5.8 provides results for DRUG30 that are similar to those for DRUG12 as the dependent variable. However, comparing Tables 5.7 and 5.8 with Tables 5.2 and 5.3 we see indications that there is a slight lessening in the deterrence effect of drug testing when we omit military officers and civilian white-collar professionals and administrative workers. The partial effects are also remarkably similar to the unrestricted sample.

Table 5.8 Logit Estimates of Drug Testing Deterrence Effect; Enlistees versus Blue Collar Civilian Workers Dependent Variable DRUG30 (Ages 17-49)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-1.5372	0.0761	0.0001	-13.33%
Female	-0.4871	0.0637	0.0001	-6.05%
Kids	-0.2233	0.0687	0.0012	-3.03%
Married	-0.6853	0.0797	0.0001	-7.95%
Black	-0.1244	0.0731	0.0889	-1.75%
Hispanic	-0.5981	0.0839	0.0001	-7.15%
Othrace	-0.0785	0.1527	0.6072	-1.12%
IRAGE	-0.0399	0.00443	0.0001	-0.58%
HSDG	-0.2219	0.0757	0.0034	3.48%
SOMCOLL	-0.3008	0.0845	0.0004	-3.98%
COLLGRAD	-0.8838	0.1542	0.0001	-9.57%
CONSTANT	-0.1130	0.1185	0.3403	17.77%
Concordance Ratio	76.4%	-	-	-
Sample Size	22,369	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

D. ANALYSIS OF SUBSTITUTION USING RESTRICTED SAMPLES

We now turn to an analysis of substitution effects using our restricted sample consisting of military enlistees verses blue-collar civilian workers. Table 5.9 represents the analysis of respondents who have consumed at least one drink within the last 30 days (LITE). We see that the positive effect of being in the military has increased slightly (compared to Table 5.3). We also observe that more educated and older respondents are more likely to have had some alcoholic beverages during the last 30 days. Partial effects indicate that there is an increase in the likelihood of being an occasional alcohol user by about 13 percent if the respondent is a member of the armed forces.

Table 5.9 Logit Estimates of Drug Testing Substitution Effect; Enlistees versus Blue Collar Civilian Workers Dependent Variable LITE (Ages 17-49)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	0.5961	0.0364	0.0001	10.15%
Female	-0.6633	0.0325	0.0001	-14.85%
Kids	-0.2178	0.0331	0.0001	-4.52%
Married	-0.2402	0.0363	0.0001	-5.01%
Black	-0.5203	0.0371	0.0001	-11.41%
Hispanic	-0.4104	0.0409	0.0001	-8.84%
Othrace	-0.5086	0.0665	0.0001	-11.13%
IRAGE	0.00056	0.00204	0.7833	-0.01%
HSDG	0.3725	0.0450	0.0001	-7.97%
SOMCOLL	0.4448	0.0477	0.0001	7.89%
COLLGRAD	0.5863	0.0666	0.0001	10.01%
CONSTANT	0.6260	0.0677	0.0001	-
Concordance Ratio	68.0%	-	-	-
Sample Size	22,377	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

The results of Table 5.10 indicate that there is a tendency for military members to abstain from both illicit drugs and heavy alcohol consumption. The magnitude of the substitution effect is not as great when officers and white-collar professionals are omitted as it was in the unrestricted sample (see Table 5.5). However the partial effects indicate that being a member of the armed forces, reduces heavy alcohol consumption by 35.14 percent. We also note an increase in the likelihood of heavy alcohol use of about 11.70 percent for those with a college education. Thus, the profile of our respondent who is most likely to use illicit drugs or abuse alcohol has not changed significantly in the two samples. He is still

likely to be a young, single, white male with low educational attainment.

Table 5.10 Logit Estimates of Drug Testing Deterrence Effect; Military versus Civilians Dependent Variable HEAVY (Ages 17-49)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-1.4708	0.0390	0.0001	-35.14%
Female	-0.4568	0.0358	0.0001	-10.89%
Kids	-0.3039	0.0356	0.0001	-7.14%
Married	-0.1968	0.0381	0.0001	-4.57%
Black	-0.4456	0.0413	0.0001	-10.62%
Hispanic	-0.4081	0.0440	0.0001	-9.69%
Othrace	-0.4556	0.0794	0.0001	-10.87%
IRAGE	-0.0175	0.00218	0.0001	-0.39%
HSDG	-0.6232	0.0476	0.0001	-15.04%
SOMCOLL	-0.4307	0.0510	0.0001	8.98%
COLLGRAD	-0.5801	0.0699	0.0001	11.70%
CONSTANT	-0.5478	0.0707	0.0001	-
Concordance Ratio	70.4%	-	-	-
Sample Size	22,377	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

E. DETERRENCE EFFECTS FOR YOUNGER AGE GROUPS

Tables 5.11 AND 5.12 analyze past-year drug use for 17-34 year olds and 17-25 year olds, respectively. They show that military members are less likely to use drugs within the last 12 months than their youthful civilian counterparts. Some differences surface when restricting the dependent variable DRUG12 to younger ages. In the 17-34 year olds sample, we find a slight lessening of the effect of all explanatory variables except BLACKS, OTHRACE, HSDG, SOMCOLL and COLLGRAD. This drop in the size of coefficients continue in Table 5.12 for the age 17-34

sample. Nonetheless, the deterrence effect is still sizeable.

Table 5.11 Logit Estimates of Drug Testing Deterrence Effect; Enlistees versus Blue Collar Civilian Workers for Alternate Ages
Dependent Variable = DRUG12 (Ages 17-34)

INDEPENDENT VARIABLE	**PARAMETER ESTIMATE**	**STANDARD ERROR**	**PR > CHI-SQUARE**	**MARGINAL EFFECTS**
Military	-1.3017	0.1287	0.0001	-18.89%
Female	-0.3769	0.0527	0.0001	-7.07%
Kids	-0.2444	0.0594	0.0001	-5.57%
Married	-0.5566	0.0643	0.0001	-9.96%
Black	-0.2444	0.0623	0.0001	-4.73%
Hispanic	-0.6157	0.0688	0.0001	-10.89%
Othrace	-0.2526	0.1265	0.0458	-4.88%
IRAGE	-0.0460	0.0054	0.0001	-0.93%
HSDG	-0.1647	0.0655	0.0119	3.47%
SOMCOLL	-0.2682	0.0727	0.0002	-5.17%
COLLGRAD	-0.5244	0.1219	0.0001	-9.47%
CONSTANT	0.6361	0.1287	0.0001	-
Concordance Ratio	71.1%	-	-	-
Sample Size	16,145	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

Table 5.12 Logit Estimates of Drug Testing Deterrence Effect; Enlistees versus Blue Collar Civilian Workers for Alternate Ages
Dependent Variable = DRUG12 (Ages 17-25)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-1.1750	0.0733	0.0001	-17.15%
Female	-0.3031	0.0642	0.0001	-5.65%
Kids	-0.2518	0.0756	0.0009	23.00%
Married	-0.5252	0.0860	0.0001	-9.24%
Black	-0.2895	0.0776	0.0002	-5.42%
Hispanic	-0.5651	0.0829	0.0001	-9.84%
Othrace	-0.1800	0.1446	0.2132	-3.46%
IRAGE	-0.0457	0.0141	0.0011	-0.91%
HSDG	-0.0633	0.0836	0.4488	1.29%
SOMCOLL	-0.1422	0.0942	0.1312	-2.76%
COLLGRAD	-0.6155	0.1951	0.0016	17.19%
CONSTANT	0.4779	0.2721	0.0790	-
Concordance Ratio	68.6%	-	-	-
Sample Size	9,115	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

Tables 5.13 and 5.14 also demonstrate that military members are less likely to use drugs within the last 30 days than their civilian counterparts. In restricting the sample for the DRUG30 model from 17-49 year olds to 17-34 year olds, we find a reduction in the impact of marital status, race and education. Further restriction of DRUG30 to 17-25 year olds finds additional reduction in the effects of marital status and race. The deterrence effect for service members is comparable to that in the unrestricted sample in Table 5.3 above.

Table 5.13 Logit Estimates of Drug Testing Deterrence Effect; Enlistees versus Blue Collar Civilian Workers for Alternate Ages
Dependent Variable = DRUG30 (Ages 17-34)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-1.4509	0.0809	0.0001	-13.47%
Female	-0.4637	0.0672	0.0001	-6.02%
Kids	-0.1914	0.0753	0.0110	-2.72%
Married	-0.6953	0.0863	0.0001	-8.39%
Black	-0.1386	0.0780	0.0756	-2.00%
Hispanic	-0.5845	0.0881	0.0001	-7.28%
Othrace	-0.0434	0.1581	0.7837	-0.65%
IRAGE	-0.0264	0.00677	0.0001	-0.40%
HSDG	-0.2595	0.0804	0.0012	4.24%
SOMCOLL	-0.3303	0.0902	0.0002	-4.48%
COLLGRAD	-0.8540	0.1668	0.0001	-9.70%
CONSTANT	-0.4284	0.1579	0.0067	-
Concordance Ratio	73.0%	-	-	-
Sample Size	16,142	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

Table 5.14 Logit Estimates of Drug Testing Deterrence Effect; Enlistees versus Blue Collar Civilian Workers for Alternate Ages
Dependent Variable = DRUG30 (Ages 17-25)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-1.3291	0.0969	0.0001	-14.97%
Female	-0.3760	0.0824	0.0001	-5.75%
Kids	-0.1664	0.0964	0.0843	-2.71%
Married	-0.8867	0.1267	0.0001	-2.90%
Black	-0.1788	0.0976	0.0669	-7.87%
Hispanic	-0.5423	0.1071	0.0001	-0.26%
Othrace	-0.0151	0.1838	0.9934	-0.26%
IRAGE	-0.00248	0.0176	0.8881	-0.04%
HSDG	-0.2136	0.1033	0.0387	3.89%
SOMCOLL	-0.2707	0.1174	0.0211	-4.27%
COLLGRAD	-1.0193	0.2693	0.0002	-12.69%
CONSTANT	-0.9853	0.3389	0.0036	-
Concordance Ratio	70.5%	-	-	-
Sample Size	9,112	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

F. SUBSTITUTION EFFECTS FOR YOUNGER AGE GROUPS

Results of restricting our sample to the younger ages for the LITE model find a greater percentage of military personnel consuming alcohol as compared to civilians. Restricting the model by age from 17-49 year olds to 17-34 year olds provides evidence of a reduction in the percentage of those drinking alcohol for all explanatory variables except MILITARY, OTHRACE and IRAGE. Further restriction to 17-25 year olds finds the reduction in percentage of respondents consuming alcohol for all explanatory variables except for FEMALE, OTHRACE, and IRAGE. The marginal effects of occasional alcohol use increase with respect to age. Compared to our base case, military members 17-34 are 9.76 percent more likely to have used alcohol within the last 30 days and 5.08 percent more likely than civilians to use alcohol at least once in the last 30 days if between the age of 17 and 25.

Table 5.15 Logit Estimates of Drug Testing Substitution Effect; Enlistees versus Blue Collar Civilian Workers for Alternate Ages
Dependent Variable = LITE (Ages 17-34)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	0.6947	0.0429	0.0001	9.76%
Female	-0.6947	0.0376	0.0001	-13.89%
Kids	-0.2566	0.0418	0.0001	-4.76%
Married	-0.3404	0.0432	0.0001	-6.44%
Black	-0.6051	0.0447	0.0001	-12.15%
Hispanic	-0.4980	0.0474	0.0001	-9.77%
Othrace	-0.5066	0.0831	0.0001	-9.96%
IRAGE	0.0345	0.0397	0.0001	0.59%
HSDG	0.3076	0.0517	0.0001	-5.77%
SOMCOLL	0.3733	0.0559	0.0001	5.80%
COLLGRAD	0.5713	0.0877	0.0001	8.35%
CONSTANT	0.6361	0.0993	0.3482	-
Concordance Ratio	70.4%	-	-	-
Sample Size	16,147	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

Table 5.16 Logit Estimates of Drug Testing Substitution Effect; Enlistees versus Blue Collar Civilian Workers for Alternate Ages
Dependent Variable = LITE (Ages 17-25)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	0.8026	0.0601	0.0001	5.08%
Female	-0.6650	0.0508	0.0001	-7.55%
Kids	-0.3353	0.0588	0.0001	-3.35%
Married	-0.4493	0.0508	0.0001	-4.69%
Black	-0.7672	0.0620	0.0001	-9.05%
Hispanic	-0.4991	0.0643	0.0001	-5.31%
Othrace	-0.4358	0.1117	0.0001	-4.52%
IRAGE	0.1397	0.0119	0.0001	1.15%
HSDG	0.1818	0.0725	0.0122	-1.71%
SOMCOLL	0.2400	0.0804	0.0028	1.90%
COLLGRAD	0.2564	0.1545	0.0970	2.02%
CONSTANT	-2.1356	0.2319	0.0001	-
Concordance Ratio	73.5%	-	-	-
Sample Size	9,117	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

Tables 5.17 and 5.18 represent heavy alcohol use. The results of further restriction of our sample by age indicate that military members are still less likely to be heavy consumers of alcohol than civilians. However, there is a reduction in the deterrence effect of being a heavy alcohol user as we restrict the age group to 17-34, and an ever greater negative effect of being in the military is still sizeable. Thus we conclude that there is no supporting evidence to conclude that military members are substituting alcohol for illicit drugs.

Table 5.17 Logit Estimates of Drug Testing Substitution Effect; Enlistees versus Blue Collar Civilian Workers for Alternate Ages
Dependent Variable = HEAVY (Ages 17-34)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-1.2200	0.0435	0.0001	-29.54%
Female	-0.4803	0.0395	0.0001	-11.36%
Kids	-0.2418	0.0429	0.0001	-5.57%
Married	-0.2953	0.0435	0.0001	-6.84%
Black	-0.4536	0.0468	0.0001	-10.70%
Hispanic	-0.4494	0.0491	0.0001	-10.60%
Othrace	-0.4798	0.0897	0.0001	-11.35%
IRAGE	0.00511	0.00394	0.1952	0.11%
HSDG	0.5770	0.0530	0.0001	-13.76%
SOMCOLL	0.3984	0.0573	0.0001	8.19%
COLLGRAD	0.7228	0.0849	0.0001	13.79%
CONSTANT	-0.0349	0.0996	0.7257	-
Concordance Ratio	67.0%	-	-	-
Sample Size	16,147	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

Table 5.18 Logit Estimates of Drug Testing Substitution Effect; Enlistees versus Blue Collar Civilian Workers for Alternate Ages
Dependent Variable = HEAVY (Ages 17-25)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-0.7773	0.0582	0.0001	-17.31%
Female	-0.5449	0.0519	0.0001	-11.72%
Kids	-0.2551	0.0600	0.0001	-5.20%
Married	-0.4348	0.0602	0.0001	-9.17%
Black	-0.4599	0.0627	0.0001	-9.75%
Hispanic	-0.3787	0.0642	0.0001	-7.90%
Othrace	-0.4195	0.1116	0.0002	-8.82%
IRAGE	0.0672	0.0113	0.0001	1.27%
HSDG	0.4101	0.0726	0.0001	-8.61%
SOMCOLL	0.2723	0.0797	0.0006	4.88%
COLLGRAD	0.6042	0.1442	0.0001	9.88%
CONSTANT	-1.3793	0.2232	0.0001	-
Concordance Ratio	63.5%	-	-	-
Sample Size	9,117	-	-	-

Notes: Based on merged 1995 DODWWS and NHSDA data.

VI. ANALYSIS OF SELECTION BIAS

A. MODEL SPECIFICATION

The models in this chapter attempt to analyze the potential influence of selection bias in the above results by creating a model that compares drug use for military and civilian samples in a period before the military's urinalysis drug testing program was initiated in 1982. By comparing the differences in drug use between military personnel and civilians during a period of no drug testing versus a period when drug testing was in effect we can assess the role of selection bias in explaining why military members have lower drug use patterns. If the lower drug use patterns of military members persist in a year when testing was not used (pre-1982), one could infer that the estimated differences in drug use using data from a period when testing was in effect, (1995) are explained by unobserved differences between the two populations in the underlying propensity to use drugs. If, instead, military members are found to use drugs at similar (or higher) rates than civilians in the no-testing (pre-1982) year, one has further support for the conclusion that the testing program (in 1995) was a causal factor in reducing drug use among military personnel. That is, this result would suggest that in the absence of a testing policy,

military personnel would have prevalence rates that mirror the civilian youth population from which they are recruited.

In this analysis we merge data from the 1980 DODWWS and 1979 NHSDA surveys[5] to create a data file similar to that which was created by merging the 1995 DODWWS and 1995 NHSDA files. By analyzing the same dependent variables used in the 1995 file (DRUG12, DRUG30, HEAVY, LITE), but using the surveys prior to implementation of the DoD's drug testing program, we can compare the drug use between military members and civilians and determine whether selection bias explains why military members have lower drug use patterns than civilians in 1995, or whether the differences in drug use in 1995 are causally linked to the testing and 'zero tolerance' policies.

The drug use models for the pre-drug testing program period are similar to those for the post-drug testing program period. However, due to differences in the data collected and variables available in the older surveys the continuous age variable (IRAGE) and the presence of children living in the household (KIDS) had to be omitted from the analysis. The model also omits officers in the military DODWWS and white-collar professional occupational

codes in the NHSDA survey. These comparison groups were constructed based on the hypothesis that blue-collar civilian workers are more comparable to military enlistees.

B. MODEL RESULTS

Table 6.1 provides the mean values (proportions) and standard deviations of the basic variables used in the new predicting models. Columns 1 and 2 provide the means and standard deviation for the combined sample. The civilian data from the 1979 NHSDA is restricted to those ages 17 to 49 to align civilians with the age groups of military members. There are 19,149 observations in the pooled sample. Column 3 provides the means for the military sample from the DODWWS, which has 15,268 observations. Column 4 provides means for the civilian sample, which contains 3,881 individuals. The sample size in the 1979 NHSDA survey is much smaller than in the 1995 NHSDA survey. In 1979 only 8,718 household members were designated as eligible to be interviewed, of these, only 7,224 completed the interview. Of those, 2,514 were under the age of 18 [Ref. 18].

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[5] There was no NHSDA survey in 1980 and no DODWWS survey in 1979.

Table 6.1 Variable Means for Military and Civilian Samples (Ages 17-49)

VARIABLE	MEAN Combined Military & Civilian	STD DEV Combined Military & Civilian	Mean Military Sample Only	Mean Civilian Sample Only
DRUG30	0.1870594	0.3899694	0.1749411	0.2347333
DRUG12	0.3499922	0.4769796	0.3555148	0.3282659
SINGLE	0.4608596	0.4984787	0.4651559	0.4439577
MARRIED	0.5093739	0.4999252	0.5220723	0.4594177
NOHSD	0.1494595	0.3565501	0.1324338	0.2164391
HSDG	0.4085331	0.4915754	0.4172125	0.3743880
SOMCOLL	0.2950546	0.4560792	0.3101258	0.2357640
COLLGRAD	0.1255418	0.3313409	0.1379356	0.0767843
AGE1	0.2246070	0.4173342	0.2099162	0.2824014
AGE2	0.3381900	0.4731059	0.3523055	0.2826591
AGE3	0.2627813	0.4401561	0.2758056	0.2115434
WHITE	0.7146065	0.4516134	0.6935420	0.7974749
BLACK	0.1644472	0.3706906	0.1763165	0.1177532
HISPANIC	0.0495065	0.2169287	0.0481399	0.0548828
OTHRACE	0.0299232	0.1703800	0.0299319	0.0298892
MALE	0.8059429	0.3954834	0.8993319	0.4385468
FEMALE	0.1847616	0.3881142	0.0890097	0.5614532
SAMPLE SIZE	19,149	-	15,268	3,881

Source: Calculated from merged 1980 DODWWS and 1979 NHSDA data

The means of several variables differ between the military and civilian samples.[6] The dependent variable DRUG12 is higher for military personnel. This is in sharp contrast to the 1995 results where drug use in the past 12 months (DRUG12) was far lower for military personnel. That is, in 1995 drug use was much lower among those in the military, whereas in 1980 drug use was higher. On the other hand, drug use in the past 30 days (DRUG30) is lower for armed forces members than civilians in both the 1980

[6] The 1979 NHSDA and 1980 DODWWS surveys use age categories (AGE1, AGE2, AGE3, AGE4) whereas the 1995 surveys use a continuous age variable (IRAGE).

and 1995 surveys. However, the difference in DRUG30 is far smaller in the earlier year than in 1995.

In the 1980 data the military had lower percentages of whites, females, single persons, and non-high school diploma grads than the civilian population. This differs from 1995 in that there were few Blacks and Hispanics among military members as compared to civilians. The means and standard deviations for the sub-samples restricted to ages 17-34 and to ages 17-25 are included in the Appendix.

Tables 6.2 and 6.3 present the logit estimates of DRUG12 and DRUG30, respectively, using the merged 1979 NHSDA and 1980 DODWWS survey data. Table 6.2 indicates that the coefficient of the military dummy variable is statistically insignificant for 17-49 year olds. That is, there is no difference in past-year drug use between military members and civilians. All of the other variables in the logit model in Table 6.2 are significant at the 5 percent level except for HISPANIC.

Table 6.2 Logit Analysis of Selection Bias
Enlistees versus Blue Collar Civilian Workers
Dependent Variable = DRUG12 (Ages 17-49)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	0.0116	0.0492	0.8135	0.11%
Female	-0.4681	0.0494	0.0001	-3.75%
Married	-0.8127	0.0382	0.0001	-5.69%
Black	-0.1034	0.0455	0.0231	-0.96%
Hispanic	0.0086	0.0766	0.9111	-0.08%
Othrace	-0.2343	0.1117	0.0360	-2.06%
HSDG	-0.1270	0.0483	0.0001	-1.16%
SOMCOLL	-0.1755	0.0532	0.0010	-1.58%
COLLGRAD	-0.7336	0.0780	0.0001	-5.30%
AGE1	2.7461	0.0947	0.0001	54.54%
AGE2	2.6510	0.0902	0.0001	52.35%
AGE3	1.5370	0.0928	0.0001	25.20%
CONSTANT	-2.1130	0.1027	0.0001	-
Concordance Ratio	76.8%	-	-	-
Sample Size	19,149	-	-	-

Notes: Calculated from merged 1980 DODWWS and 1979 NHSDA data.

Table 6.3 Logit Analysis of Selection Bias
Enlistees versus Blue Collar Workers
Dependent Variable = DRUG30 (Ages 17-49)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-0.5716	0.0538	0.0001	-2.79%
Female	-0.5069	0.0580	0.0001	-2.59%
Married	-0.7313	0.0470	0.0001	-3.39%
Black	-0.3737	0.0552	0.0001	-1.98%
Hispanic	-0.2004	0.0898	0.0256	-1.14%
Othrace	-0.5525	0.1493	0.0002	-2.72%
HSDG	-0.0448	0.0539	0.4061	-0.27%
SOMCOLL	-0.0591	0.0608	0.3309	-0.36%
COLLGRAD	-0.5955	0.0989	0.0001	-10.44%
AGE1	2.6488	0.1344	0.0001	43.55%
AGE2	2.5834	0.1308	0.0001	41.92%
AGE3	1.5457	0.1357	0.0001	18.42%
CONSTANT	-2.6404	0.1408	0.0001	-
Concordance Ratio	74.1%	-	-	-
Sample Size	19,149	-	-	-

Notes: Calculated from merged 1980 DODWWS and 1979 NHSDA data.

This difference in past-year drug use does not apply to drug use in the past 30 days. The results of Table 6.3 indicate that military personnel are significantly less likely to have used drugs in the last 30 days. However, the difference is rather small, about 2 percentage points. All of the other variables in Table 6.3 are significant at the 5 percent level except for HSDG and SOMCOLL.

Comparing results of our model in the pre-testing years, 1979/1980, to the results from the post-testing years, 1995, suggests that the military's testing and 'zero tolerance' policies explain much of the lower illicit drug use when using the DRUG12 measure. Thus, it appears that for longer run use, the military testing program has a significant deterrence effect. Although short-run, DRUG30, use was lower in both years for military members, the difference in 1979/1980 was far smaller than it was in 1995. Column (4) of our Tables depicts the marginal effects and shows that drug use among military personnel was 13.3 percentage points lower in 1995 but only 2.7 points lower in 1979/1980. This result is broadly consistent with the DRUG12 result. Drug use of military personnel was much closer to or identical to that of civilians in 1979/1980 before drug testing policies were instituted.

Tables 6.4 through 6.7 we present our results of the logit estimates using the merged 1979 NHSDA and 1980 DODWWS data comparing enlisted military members versus civilians in blue-collar occupations, with age restricted to 17-34 and 17-25, respectively.

Table 6.4 Logit Analysis of Selection Bias
Enlistees versus Blue Collar Civilian Workers
Dependent Variable = DRUG12 (Ages 17-34)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	0.0662	0.0504	0.1888	1.53%
Female	-0.4678	0.0501	0.0001	-9.85%
Married	-0.7942	0.0390	0.0001	-15.56%
Black	-0.1351	0.0463	0.0035	-3.03%
Hispanic	-0.0028	0.0778	0.9710	-0.07%
Othrace	-0.2742	0.1158	0.0179	-5.99%
HSDG	-0.1426	0.0493	0.0038	-3.19%
SOMCOLL	-0.2055	0.0545	0.0002	-4.55%
COLLGRAD	-0.7919	0.0816	0.0001	-4.55%
AGE1	1.2116	0.0551	0.0001	29.40%
AGE2	1.1139	0.0463	0.0001	27.14%
CONSTANT	-0.6008	0.0725	0.0001	-
Concordance Ratio	70.5%	-	-	-
Sample Size	15,809	-	-	-

Notes: Calculated from merged 1980 DODWWS and 1979 NHSDA data.

The patterns of drug use for the younger samples is generally in line with the patterns for the older (17-49) age groups. Table 6.4 reveals, again, no significant difference in past-year drug use between the two populations. Table 6.5 shows past-month use in 1979/1980 was 8.3 percentage points lower for those in the military, about half of the 13.3 point difference in 1995. The most notable difference arises in Table 6.6, for the youngest

age group, 17-25. Table 6.6 shows that drug use over the past year (DRUG12) is <u>higher</u> for those in the military in 1979/1980, and the difference is statistically significant. The marginal effects shown in column (4) indicate that past year use is 4.3 points higher in 1979/1980 for uniformed personnel. Finally, DRUG30 is somewhat lower in the early years in Table 6.7.

Table 6.5 Logit Analysis of Selection Bias
Enlistees versus Blue Collar Civilian Workers
Dependent Variable = DRUG30 (Ages 17-34)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-0.5273	0.0547	0.0001	-8.38%
Female	-0.4923	0.0586	0.0001	-7.90%
Married	-0.6986	0.0476	0.0001	-10.54%
Black	-0.4024	0.0559	0.0001	-6.63%
Hispanic	-0.2129	0.0906	0.0188	-3.70%
Othrace	-0.5834	0.1533	0.0001	-9.12%
HSDG	-0.0589	0.0544	0.2794	-1.07%
SOMCOLL	-0.0715	0.0615	0.2450	-1.29%
COLLGRAD	-0.6071	0.1018	0.0001	-9.42%
AGE1	1.1206	0.0683	0.0001	25.32%
AGE2	1.0457	0.0605	0.0001	23.45%
CONSTANT	-1.1351	0.0850	0.0001	-
Concordance Ratio	68.5%	-	-	-
Sample Size	15,809	-	-	-

Notes: Calculated from merged 1980 DODWWS and 1979 NHSDA data.

Table 6.6 Logit Analysis of Selection Bias
Enlistees versus Blue Collar Civilian Workers
Dependent Variable = DRUG12 (Ages 17-25)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	0.1911	0.0559	0.0006	4.38%
Female	-0.5094	0.0551	0.0001	-12.48%
Married	-0.7056	0.0454	0.0001	-17.37%
Black	-0.2748	0.0519	0.0001	-6.64%
Hispanic	-0.1224	0.0867	0.1578	-2.92%
Othrace	-0.4287	0.1439	0.0029	-10.47%
HSDG	-0.1948	0.0540	0.0003	-4.68%
SOMCOLL	-0.3482	0.0616	0.0001	-8.46%
COLLGRAD	-0.9767	0.1093	0.0001	-23.94%
AGE1	0.1048	0.0443	0.0180	2.93%
CONSTANT	0.4978	0.0695	0.0001	-
Concordance Ratio	61.4%	-	-	-
Sample Size	10,777	-	-	-

Notes: Calculated from merged 1980 DODWWS and 1979 NHSDA data.

Table 6.7 Logit Analysis of Selection Bias
Enlistees versus Blue Collar Civilian Workers
Dependent Variable = DRUG30 (Ages 17-25)

INDEPENDENT VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	PR > CHI-SQUARE	MARGINAL EFFECTS
Military	-0.4197	0.0595	0.0001	-10.12%
Female	-0.4973	0.0631	0.0001	-11.89%
Married	-0.5934	0.0528	0.0001	-14.02%
Black	-0.5156	0.0610	0.0001	-12.30%
Hispanic	-0.3042	0.0979	0.0019	-7.41%
Othrace	-0.6515	0.1778	0.0002	-15.27%
HSDG	-0.0847	0.0573	0.1394	-2.10%
SOMCOLL	-0.1205	0.0665	0.0702	-2.98%
COLLGRAD	-0.7229	0.1313	0.0001	-16.77%
AGE1	0.0984	0.0478	0.0397	2.45%
CONSTANT	-1.1551	0.0736	0.0351	-
Concordance Ratio	60.3%	-	-	-
Sample Size	10,777	-	-	-

Notes: Calculated from merged 1980 DODWWS and 1979 NHSDA data.

In summary, the results of Tables 6.4 through 6.7 provide similar results for each age category for the pre-drug testing years. Table 6.2 indicates that drug use

among military members (within the last 12 months) is actually higher among military members than their civilian counterparts. The result is not statistically significant in the 17-49 year-old sample but by restricting the sample further by age to 17-34 and 17-25 year-olds (Tables 6.4 and 6.6) we find that the level of significance increases to 1 percent in the 17-25 year-olds sample. Significance of this result indicates that selection bias is not present in determining whether a military member is more likely to use drugs in the absence of the testing program. All variables in the 17-49 and 17-35 year-old DRUG12 model are significant at the 5 percent level except for MILITARY and HISPANIC. In Table 6.6, restricting the DRUG12 model to 17-25 year-olds yields a 1 percent level of significance for all variables except for HISPANIC.

Table 6.3 represents a respondent's use of drugs within the last 30 days. In this case military members were <u>less</u> inclined to use drugs than their civilian counterparts and the coefficient is statistically significant at the 1 percent. Restricting the sample to 17-34 and 17-25 year olds yields essentially the same results and significance for the DRUG30 variable.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

This study considered the direct impact of the military's drug prevention policies in terms of deterring would-be drug users. It has also attempted to measure the secondary impact of the drug programs in terms of possibly inducing personnel to substitute one type of substance for another, in particular substituting legal drugs or alcohol for illegal drugs.

The results of the data analysis indicate that the military's drug testing and zero tolerance polices are a deterrent to illegal drug use. However, in some cases drug testing also appears to be a causal factor in service members substituting away from illegal substances toward legal forms of drugs such as alcohol. Two measures of alcohol consumption are used: (1) occasional use, and (2) heavy use. In the case of heavy alcohol use we find that drug prevention policies have complimentary effects, i.e., that those in the military are less likely to be heavy alcohol users.

Additionally, we determined that the role of selection bias in explaining the observed differences in drug use between the military and civilian sectors is small. Our evidence comparing pre-drug program data to post-drug

program data suggests that those who enter the military are just as likely to use illicit drugs as their civilian counterparts. It is the presence of the DoD's drug testing and prevention polices that appears to deter illicit drug use.

One limitation of the study is that the variables in the model exhibit some multicollinearity. For example being single and young (SINGLE, AGE1) are highly collinear, as are age and marital status. Regardless of this collinearity, these variables are deemed important and it is felt that the multicollinearity that exists would not be detrimental in influencing the predictive power of the model. A second limitation is that stratification procedures in the sampling design of the 1980 DODWWS may require the use of the weights constructed for the survey to accurately asses the impact of explanatory variables. Thus, the results in Chapter VI should be viewed with caution as the constant term and error variances may be biased.

B. POLICY IMPLICATIONS

It is difficult to derive firm policy implications from these results. It is still possible that the benefits often attributed to the urinalysis program may be overstated due to some degree of selection bias. However,

we find little evidence of this in our analysis. The DoD's urinalysis program appears to be a major factor in contributing to a deterrence effect among military members. The type of individual that is attracted to the military is not necessarily by his or her nature more likely to refrain from illicit drugs.

The results of our study have identified a potential secondary effect of the DoD's drug abuse prevention program. The program appears to stimulate occasional alcohol use but to discourage heavy alcohol use. It is also prudent to suggest that attempts to measure the effectiveness of the current drug deterrence policy may need to heed the possibility that individuals make drug use choices based on factors relating to variables not represented in current models.

C. RECOMMENDATIONS

Further study is recommended in the following areas. First, an analysis of job performance of respondents defined as heavy drinkers should be undertaken. For example, the relationship between heavy drinking and absenteeism, on-the-job productivity and injuries should be studied. Any method that can quantify or measure one's job performance as it relates to heavy drinking would provide additional information for policy decisions. Second, the

use of a continuous measure of alcohol consumption or/and additional definitions of alcohol consumption should be explored. Previous studies have used different definitions for "Heavy" alcohol consumption. Research that includes a continuous alcohol consumption variable might yield additional useful information on deterrence and substitution effects. Third, a study should be undertaken to measure the effects of anti-drinking campaigns in the military as well as the deterrence effects of penalties imposed as a result of an alcohol-related incident. Fourth, a fuller analysis of selection bias should be attempted. For example, formal statistical tests of selection bias may be possible with other data sets. Unfortunately, the DODWWS and NHSDA surveys did not contain the information necessary for these statistical tests. Finally, the weights supplied for the 1980 DODWWS should be applied and models in Chapter VI re-estimated.

APPENDIX: VARIABLE MEANS AND STANDARD DEVIATIONS

Table 1 Variable Means for samples of individuals Ages 17-34, in 1995 Merged Data File

VARIABLE	MEAN Combined Military & Civilian (Age 17-34)	STD DEV Combined Military & Civilian (Age 17-34)	Mean Military Sample Only	Mean Civilian Sample Only
HEAVY	0.3429899	0.4747205	0.2225425	0.4669067
LITE	0.6522602	0.4762654	0.7702522	0.5308694
DRUG30	0.0713204	0.2573660	0.0304840	0.1133114
DRUG12	0.1301420	0.3364684	0.0673324	0.1947474
SINGLE	0.5469256	0.4978061	0.4661863	0.6299905
MARRIED	0.4530744	0.4978061	0.5338137	0.3700095
KIDS	0.4373630	0.4960740	0.3571796	0.5198560
NOHSD	0.1209416	0.3260680	0.0212043	0.2235518
HSDG	0.3538992	0.4705610	0.3826042	0.3243673
SOMCOLL	0.3309322	0.4705610	0.4287185	0.2303293
COLLGRAD	0.1588892	0.3655823	0.1674730	0.1500582
IRAGE	25.6787243	5.1246484	25.6328358	25.7259346
WHITE	0.5806974	0.4934578	0.6858466	0.4725193
BLACK	0.1972544	0.3979364	0.1634586	0.2320237
HISPANIC	0.1769496	0.3816360	0.0908904	0.2654877
OTHRACE	0.0450987	0.2075259	0.0598044	0.0299693
MALE	0.5920242	0.4914714	0.7773546	0.4013555
FEMALE	0.4079758	0.4914714	0.2226454	0.5986445
SAMPLE SIZE	19,158	-	9,715	9,443

Source: Calculated from merged 1995 DODWWS and 1995 NHSDA data

Table 2 Variable Means for sample of individuals Ages 17-25, in 1995 Merged Data File

VARIABLE	MEAN Combined Military & Civilian (Age 17-25)	STD DEV Combined Military & Civilian (Age 17-25)	Mean Military Sample Only	Mean Civilian Sample Only
HEAVY	0.0902531	0.4787336	0.3006782	0.4199735
LITE	0.6503454	0.4768851	0.7797664	0.4988977
DRUG30	0.0902531	0.2865586	0.0439374	0.1444004
DRUG12	0.1680553	0.3739344	0.1002639	0.2473545
SINGLE	0.7188135	0.4496011	0.6260362	0.8273810
MARRIED	0.2811865	0.4496011	0.3739638	0.1726190
KIDS	0.2831166	0.4505355	0.1812359	0.4023369
NOHSD	0.1139781	0.3178008	0.0199699	0.2239859
HSDG	0.4283828	0.4948695	0.5324039	0.3066578
SOMCOLL	0.3134905	0.4639354	0.3830068	0.2321429
COLLGRAD	0.0753759	0.2640103	0.0646194	0.0879630
IRAGE	21.3315725	2.3829661	21.7518839	20.8397266
WHITE	0.5745632	0.4944342	0.6840618	0.4464286
BLACK	0.1947221	0.3952337	0.1514695	0.2431658
HISPANIC	0.1832588	0.3868982	0.1032404	0.2768959
OTHRACE	0.0484559	0.2147385	0.0612283	0.0335097
MALE	0.6156034	0.4864770	0.7639412	0.4420194
FEMALE	0.3843966	0.4864770	0.2360588	0.5579806
SAMPLE SIZE	9,844	-	5,308	4,536

Source: Calculated from merged 1995 DODWWS and 1995 NHSDA data

Table 3 Variable Means for sample of individuals
Ages 17-34 in the 1979/1980 Merged Data File

VARIABLE	MEAN Combined Military & Civilian (Age 17-34)	STD DEV Combined Military & Civilian (Age 17-34)	Mean Military Sample Only	Mean Civilian Sample Only
DRUG30	0.2224682	0.4159171	0.2067214	0.2893165
DRUG12	0.4147005	0.4926859	0.4177413	0.4017916
SINGLE	0.5254602	0.4993672	0.5317702	0.4986729
MARRIED	0.4393067	0.4963184	0.4540055	0.3769078
NOHSD	0.1467519	0.3538696	0.1354435	0.1947578
HSDG	0.4360175	0.4959050	0.4533802	0.3623092
SOMCOLL	0.2929344	0.4551230	0.3038687	0.2465163
COLLGRAD	0.0986780	0.2982386	0.1049629	0.0719973
AGE1	0.2720602	0.4450348	0.2504885	0.3636364
AGE2	0.4096401	0.4917829	0.4203986	0.3639684
AGE3	0.3182997	0.4658312	0.3291129	0.2723955
WHITE	0.7034601	0.4567463	0.6808910	0.7992701
BLACK	0.1739515	0.3790798	0.1874951	0.1164565
HISPANIC	0.0526282	0.2232973	0.0517390	0.0564035
OTHRACE	0.0265039	0.1606333	0.0261821	0.0278699
MALE	0.8028971	0.3978233	0.8850331	0.4542137
FEMALE	0.1870454	0.3899603	0.1025401	0.5478639
SAMPLE SIZE	15,809	-	12,795	3,014

Source: Calculated from merged 1980 DODWWS and 1979 NHSDA data

Table 4 Variable Means for samples of individuals Ages 17-25 in the 1979/1980 Merged Data File

VARIABLE	MEAN Combined Military & Civilian (Age 17-25)	STD DEV Combined Military & Civilian (Age 17-25)	Mean Military Sample Only	Mean Civilian Sample Only
DRUG30	0.2856082	0.4517246	0.2724837	0.3369813
DRUG12	0.5199963	0.4996232	0.5341333	0.4646603
SINGLE	0.6457270	0.4783146	0.6689189	0.5549476
MARRIED	0.3071356	0.4613275	0.3155871	0.2740538
NOHSD	0.1683214	0.3741688	0.1613467	0.1956224
HSDG	0.4969843	0.5000141	0.5342498	0.3511172
SOMCOLL	0.2517398	0.4340327	0.2554753	0.2371181
COLLGRAD	0.0462095	0.2099483	0.0464818	0.0451436
AGE1	0.3990907	0.4897342	0.3733691	0.4997720
AGE2	0.6009093	0.4897342	0.6266309	0.5002280
WHITE	0.6952770	0.4603114	0.6689189	0.7984496
BLACK	0.1834462	0.3870499	0.2010718	0.1144551
HISPANIC	0.0561381	0.2301988	0.0556850	0.0579115
OTHRACE	0.0199499	0.1398346	0.0175909	0.0291838
MALE	0.7903869	0.4070514	0.8703402	0.4774282
FEMALE	0.1980143	0.3985215	0.1150979	0.5225718
SAMPLE SIZE	10,777	-	8,584	2,193

Source: Calculated from merged 1980 DODWWS and 1979 NHSDA data

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